Advanced Composite Bipolar Plate for Unitized Regenerative Fuel Cell/Electrolyzer Systems, Phase I

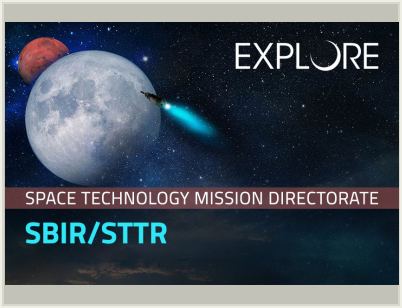
Completed Technology Project (2007 - 2007)

Project Introduction

Development of an advanced composite bipolar plate is proposed for a unitized regenerative fuel cell and electrolyzer system that operates on pure feed streams (H2/O2 and water, respectively). The composite bipolar plate can greatly simplify "closed-loop" unitized fuel cell/electrolyzer power systems, as it eliminates the need for saturators, a second stack and water/gas phase separation. It provides a substantial system improvement over presently used alkaline systems in that it allows for simple high pressure operation with a high differential pressure. Additionally, it allows for dead-ended H2 and O2 feed for the fuel cell, eliminating parasitic pumping losses required for water removal. Phase I will demonstrate composite bipolar plate-based fuel cell and electrolyzers, and quantify the composite bipolar plate transport and mechanical properties required for system design. In Phase II a full unitized composite bipolar plate stack would be designed and built to size according to NASA requirements.

Anticipated Benefits

Potential NASA Commercial Applications: Potential products foreseen are: the composite bipolar plate PEM electrolyzer; the composite bipolar plate PEM fuel cell; and closed loop, discrete, and unitized PEM regenerative fuel cell (RFC) systems. Electrolyzer applications include H2 generation for gas chromatography, industrial uses and hydrogen refueling stations. PEMFC applications include vehicles and stationary power, where the internal water management provides a large system advantage. Closed-loop regenerative fuel cell systems could use a unitized stack which provides the promise of decreasing stack weight by half for combined PEM fuel cell and electrolyzer systems. A composite bipolar plate greatly simplifies water management for a unitized stack by managing water completely in the vapor phase. Industrial applications include power back-up for computer and energy related systems.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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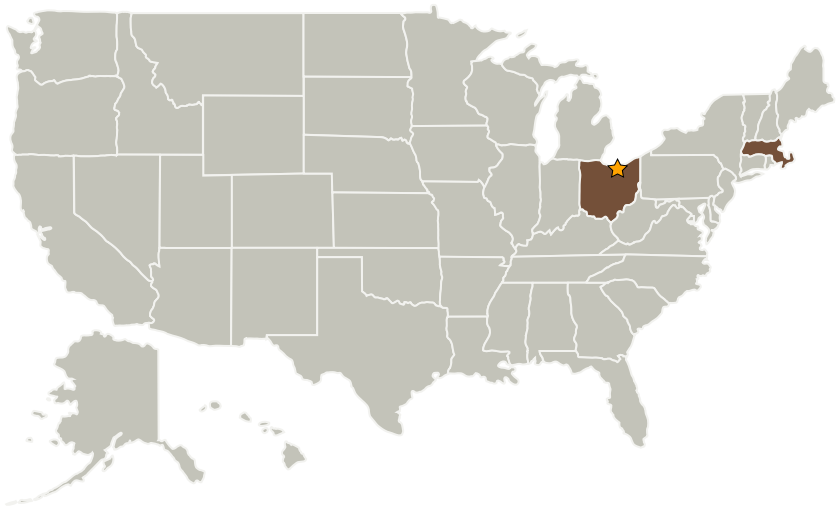
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Giner Electrochemical Systems, LLC	Supporting Organization	Industry	Newton, Massachusetts

Primary U.S. Work Locations	
Massachusetts	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Cortney K Mittelsteadt

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.2 Electrochemical: Fuel Cells